TEACHING INDOOR ORIENTATION TO
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AN AUDITORY APPROACH

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Teaching Indoor Orientation to Multiply Impaired Blind Persons:

An Auditory Approach

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Teaching Indoor Orientation to Multiply Impaired Blind Persons: An Auditory Approach

For the retarded blind the conventional orientation and mobility approach of teaching routes by repitition and structured guidance is tedious and often unproductive. It does not get at the core of the orientation problem: understanding the meaning of a directional landmark. In a 1976 published report a pilot program was conducted to teach ward layout to 9 retarded blind residents at a state institution for the retarded. (Uslan, 1976). Residents in the pilot program were directed to their destination through the use of strategically placed speakers that played music associated with the task at hand (e.g., lunchroom music directed residents to the cafeteria at lunchtime).

Although no attempt was made to systematically evaluate the results of the 1976 pilot program, observations were encouraging, especially from the standpoint of the residents' self-satisfaction in traveling without any human assistance. It seemed that highlighting landmarks with music not only made travel less confusing, but also make it more enjoyable.

It is likely that the impact of success on an institution's staff would be positive. An increase in resident independent travel behavior can minimize the need for individualized attention in transporting residents. And since the teaching system can be implemented by the staff, orientation and mobility consultation time could be diverted from rote familiarization activities in habitually traveled environments to remedial efforts in more stimulating environments.

The purpose of this project was to replicate the 1976 pilot program incorporating equipment improvements and a research design to test the effectiveness of the program.

There were two primary objectives:

1. Increasing learning efficiency for clients who have difficulty learning routes in the habitually traveled environment.
2. Giving personnel dealing with these clients on a day-to-day basis a new effective means of stimulating independence in the habitually traveled indoor environment.

The AID System

Since the intent of the teaching system is to direct a traveller to interior destinations, it was named the Auditory Interior Director (AID) System. Along route paths in a facility, mat sensors are placed on the floor at strategic positions where orientation decisions must be made. When stepped on, a mat activates a speaker ahead of the traveller in the correct direction to any of a number of destinations. After a staff person selects the desired destination at the central control box, the initial mat that is stepped on by the traveller activates a speaker that plays music that is designated for the destination thereby directting the traveller to the next speaker activated mat, and so on, to the destination. Figure 1 illustrates the major electronic components of the AID System.

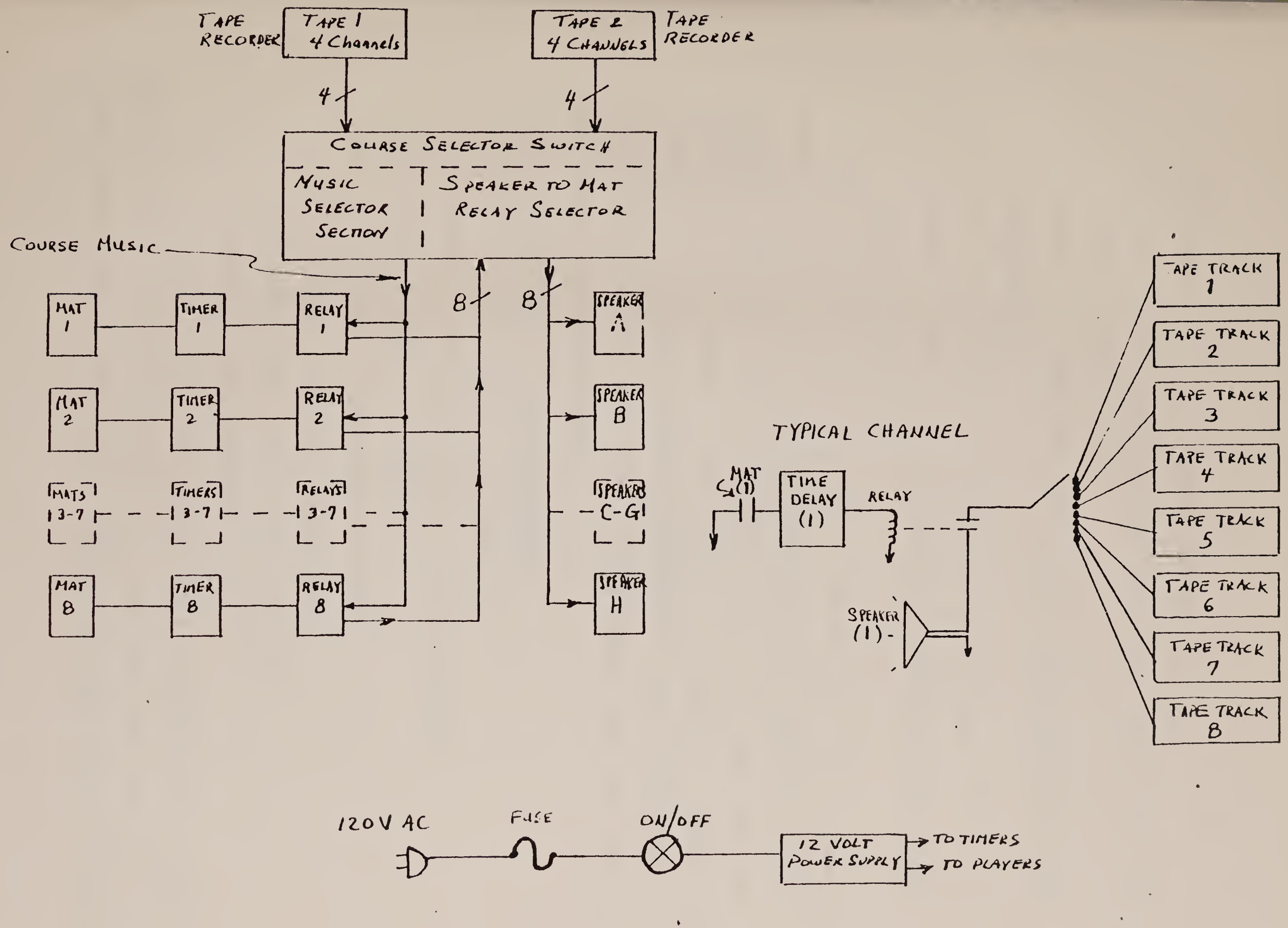

FIGURE 1. BLOCK DIAGRAM OF THE A.I.D. SYSTEM

Operation of the AID System presupposes that:

1. Users are not hearing impaired to the extent that they cannot localize sound.
2. Users are clear about the musical designations of each destination.
3. Only one person at a time uses the system.
4. A staff person selects the desired destination on the central control box.

The AID System was installed in the Pioneer Activity Center, a workshop setting for multiply impaired blind persons located in Syracuse, New York. The routes chosen were those that were the most troublesome for clients. Figure 2 shows the layout of routes within the Center. The routes covered approximately 180 linear feet in the 9,000 square foot facility. The 8 destinations and their musical designations are listed below:

d_1 - Time Clock; "The Entertainer"

d_2 - Men's Room; "Fifth of Beethoven"

d_3 - Remedial Education Room; "Close Encounters"

d_4 - Ladies' Room; "I am Woman"

d_5 - Coffee Shop; "Food Glorious Food"

d_6 - Music Room; "Handel's Water Music"

d_7 - Recreation Room; "Theme from Superman"

d_8 - Counseling Room; "Amazing Grace"

As an example of how the system works, suppose that a client wishes to get to the Coffee Shop (d_5) from the Time Clock (d_1). A staff member goes to the central control box (See Figure 3) and turns

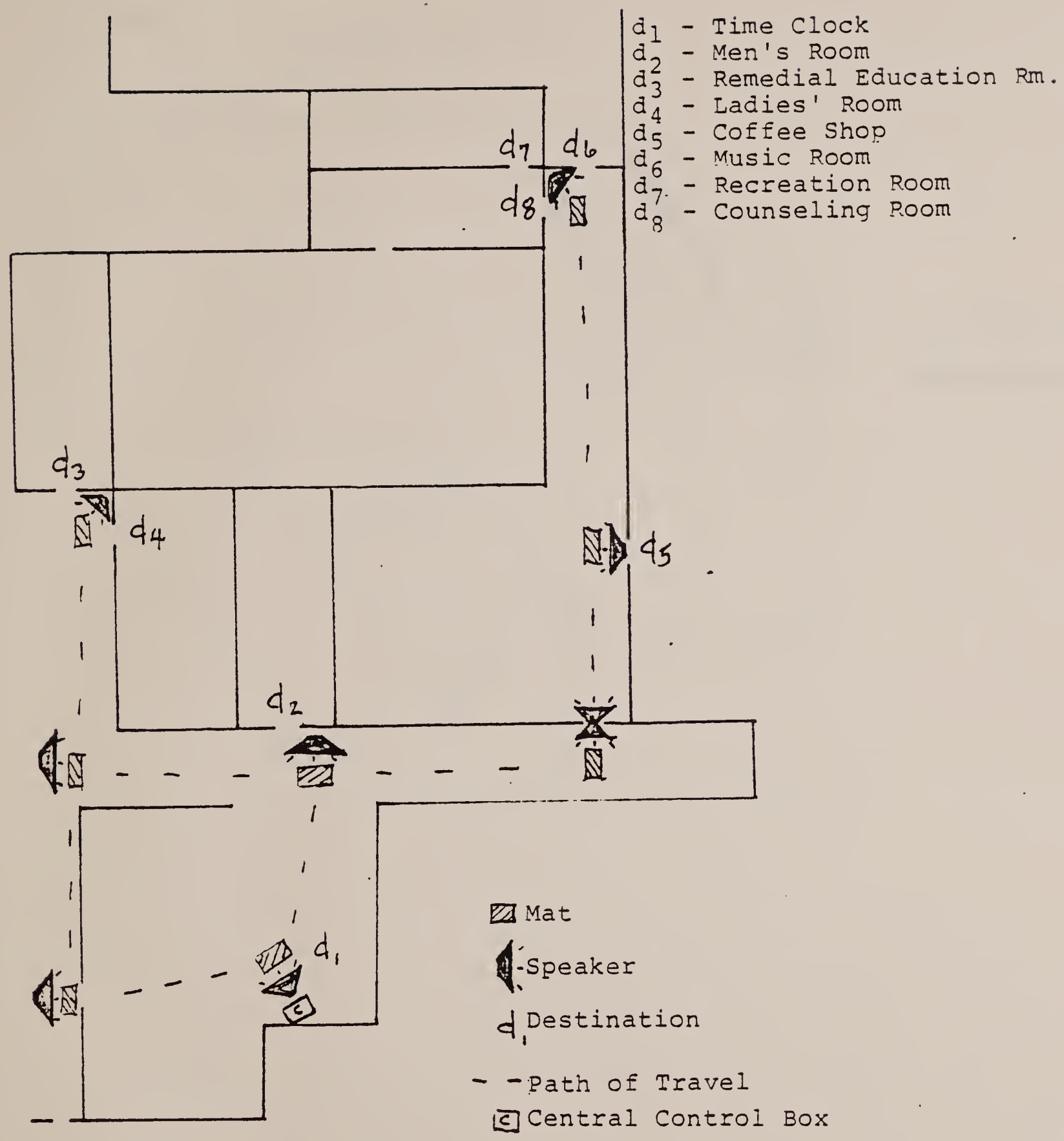

Figure 2. The Network of Routes and the Location of Mat Sensors and Speakers in the Pioneer Activities Center.

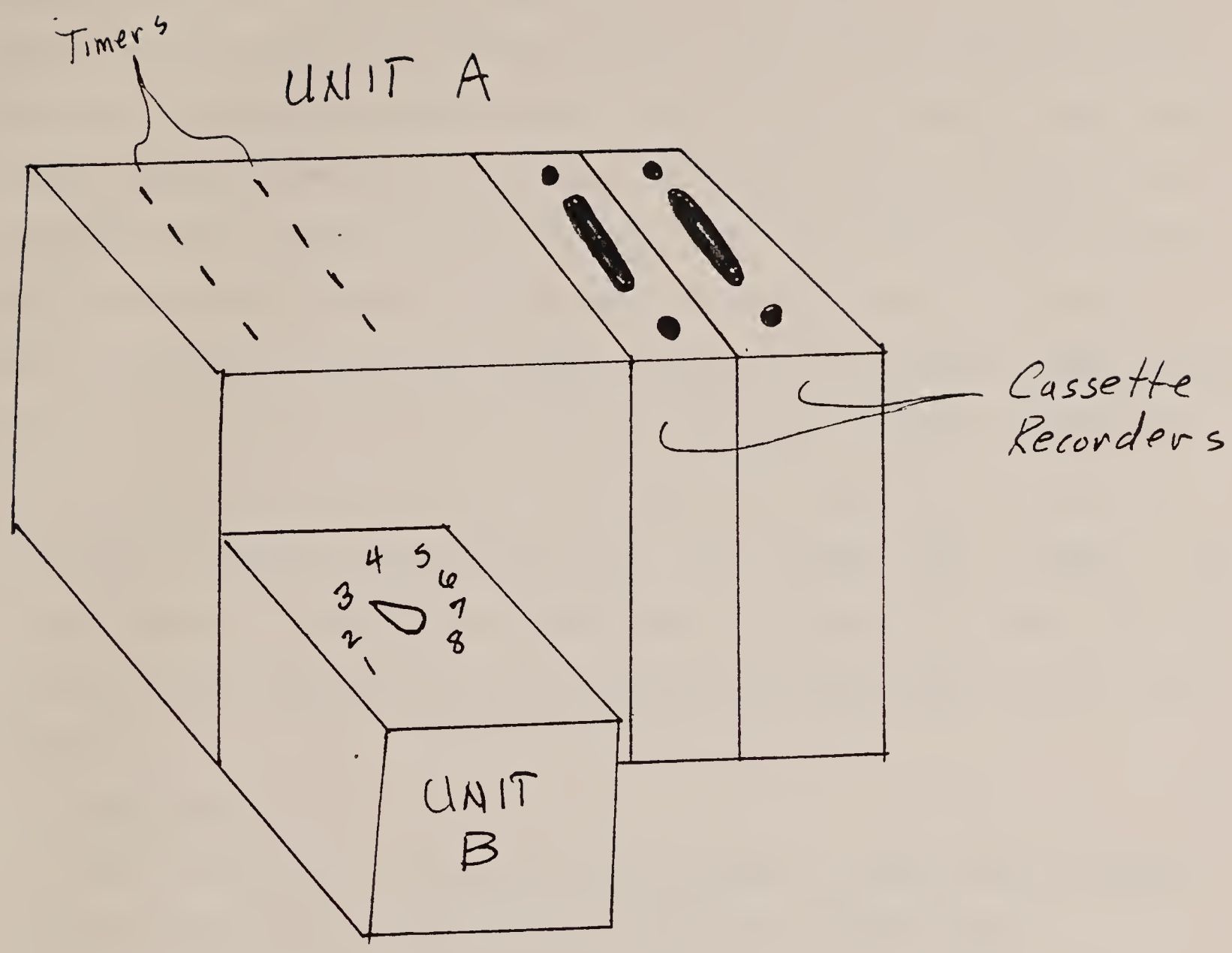

Figure 3. The Central Control Box consists of two units. Unit A houses the cassette tape machines and all the wiring and timers necessary for their correct operation. Unit B houses the switches necessary for turning the system on and selecting destinations.

the dial to d_5, and tells the client that he may begin to walk to the Coffee Shop. The first mat the client steps on is the one located just in front of the Time Clock. The speaker located at d_2 broadcasts the Coffee Shop music ("Food Glorious Food") until the client reaches the mat at d_2. When he steps on the mat at d_2, he activates the speaker located at the hallway turning point on the way to the Coffee Shop. He proceeds to it and steps on the mat which activates the final speaker located at the Coffee Shop. Should he wish to return to the Time Clock, the staff member need only dial d_1 on the central control box and the sequence of mats and speakers (playing "The Entertainer") will direct the client on the return route. It should be noted that a traveler can enter the AID System at any destination and be directed from there to any destination.

The Method

The criteria for subject participation on the project were:

1. The ability to localize the sound of musical cues.
2. Visual impairment (Legally blind at best)
3. Problems in learning routes in the habitually travelled environment to the extent that sighted assistance is always necessary.

Initially, 12 visually impaired clients were selected for review as possible candidates. These clients were systematically observed for several weeks to identify severity and frequency of disorientation. During this period, 2 clients were eliminated because the disorientation problems they were encountering were corrected with practice.

The 10 clients were screened for auditory localization ability. Each client was seated and asked to face straight ahead. Music was played in a portable tape recorder in 10 psuedo-random positions 360 degrees around the subject. The radius of the test circle varied from 3 to 10 feet. Prior to testing, each client was told that the object of the test was to point to where the music was coming from each time it was played.

All but one client was able to consistently and accurately point to the origin of the music. This client did not participate in the project.

Individual meetings with the 9 clients were held in order to discuss the concept of the AID System. It was explained that the system would help them get around the building without the assistance of a staff person. Details were also given on what was expected of them to effectively use the AID System.

Since staff and clients alike would be hearing the music often, the selection of the musical pieces was made only after everyone was consulted about musical preferences. Then, for a 3 week period the musical pieces were paired to destinations through exposure. This was accomplished by playing the designated music in the room that it was going to represent each time the clients entered and left the room.

During the 6 to 8 weeks it took to select the 9 clients and expose them to the music, the AID System was built and installed. It is important to note that unexpected technical difficulties are commonplace in prototype engineering and developing the AID

System was no exception. Since there is little that can be done about this debugging process, conducting a concurrent objective evaluation study takes considerable flexibility in planning and execution. In retrospect, it can be said that to have kept to a rigid schedule for a research design with control and experimental groups would have been frustrating for both subjects and experimentors because of equipment "down time." What's more, attempting such a structured approach would have yielded results of questionable validity.

The decision was made to forgo a research design with elaborate controls and, instead, concentrate on naturalistic observation of clients during and after training with the AID System. Four clients who were observed while using the AID System are described in Table 1.

TABLE I. THE CLIENTS WHO WERE TRAINED TO USE THE AID SYSTEM

	Age	Sex	Visual Status	Significant Facts
Client A	28	M	Totally Blind (congenital)	IQ of 69-70. Intermittent explosive behavior. Received indoor O&M training.
Client B	58	F	Light perception due to cataracts (ou). Recent onset.	Long history of hospitalization due to schizophrenia (paranoid type), presently in remission. Dependent personality. No formal O&M training.
Client C	27	M	Totally blind (congenital) due to RLF.	Confined to wheelchair due to cerebral palsy. Received indoor O&M training.
Client D	23	F	Totally blind (congenital) due to RLF.	Minimal receptive and expressive language skills. Requires assistance in all activities of daily living. No formal O&M.

Training was conducted during a 45 minute time slot scheduled for 2 times per week for 4 weeks. The AID System was then turned off for two weeks and behavior was observed. After that, the system was turned back on.

An instructional format was used to teach the client how to use the AID System. Instruction was withdrawn if and when the client showed evidence of the ability to use the system independently.

The instructional format consisted of the following steps:

1. The client is told that he will be having a mobility lesson, and a destination is chosen (preferably by the client).
2. Using a sighted guide, the instructor leads the client to the central control box and gives a quick review of how the AID System works (i.e. Follow the music to the destination, etc.).
3. The instructor turns on the System and steps on the first mat to identify the musical selection and to reestablish the idea that the music represents the destination.
4. The client is then encouraged to start walking independently in the direction of the first mat. When the first mat is stepped on and the music is playing, the client is asked to point to where it is coming from and to go toward it. This is continued from mat to mat to the destination.
5. If distractions occur, or if for any reason the client becomes confused, assistance is given.
6. Upon arrival at the destination, praise and encouragement are given.

Results

It took Client A five instructional sessions to learn to use the AID System. Initially on the fifth session, Client A showed a better grasp of the AID system. By the end of the session, the client had traveled two routes successfully. For Client A these successes contributed to a new sense of

accomplishment which was repeatedly demonstrated by verbal and physical expressions of joy. On the following session, Client A was able to go to destinations independently and without the AID System. He continued to indicate that he was pleased with his performance.

Client A only continued this new level of independent mobility without the AID System for a short time. Within two weeks, mobility performance had deteriorated to the point where he was again totally dependent on staff assistance. The AID system was then used and Client A's mobility improved. Presently, Client A travels successfully to all destinations using the AID System.

For the first three instructional sessions, Client B would not respond when left to try the routes on her own. She would stand in one spot and shuffle her feet. When physically coaxed, she would only walk a few steps. Only once did she walk from one mat to another by herself. This type of dependent behavior is consistent with Client B's history of extreme dependence.

For the next four instructional sessions, Client B traveled increasingly on her own, yet verbal and physical reassurance were always necessary. The AID System was not used for two weeks and Client B's mobility behavior immediately returned to total dependence on staff. When use of the AID System was resumed, Client B again traveled increasingly on her own (e.g. less physical and verbal assurances needed) and by the third instructional session, physical promptingwas successfully withdrawn.

Client C responded immediately to the AID System and traveled successfully to all destinations on the first instructional session. After a few practice sessions, the AID System was turned off. Client C maintained his independent mobility for two weeks and all indications are that this behavior will continue. The AID System will be used for periodic reinforcement only if independent travel skill deteriorates.

For the first two instructional sessions, Client D was unable to follow the music on her own. During the third session, Client D successfully traveled a simple route to the ladies room. Client D uses meaningful expressive language very sparingly, but in this situation she was extremely excited about her performance and exclaimed, "Bathroom! Bathroom!" However, the learning of new and more difficult routes has been taking place at a much slower rate. Use of the AID System was not temporarily withdrawn because, to date, results have not been significant enough for meaningful comparisons. However, Client D's response to AID System continues to be enthusiastic.

Discussion

All clients responded enthusiastically to the AID System. Clearly, following music was motivating to the clients. As far as increasing independent travel behavior, Clients A and C showed dramatic improvement. Client B travels to all destinations but still needs verbal prompting. Client D has shown improvement in travel behavior in that she can travel independently to one destination but performance is not consistent over trials. It should be noted that independent travel behavior is an all or nothing phenomenon and it is conceivable that Clients B and D will show dramatic improvement in the future.

Two design flaws in the AID System were discovered during the study. Firstly, the control box contains timers for adjusting the length of time a speaker will broadcast music. It took very little experience with the AID System to realize that independent and adjustable control of broadcast time serves no useful purpose and in fact, causes considerable disruption. If a speaker broadcasts longer than mat to mat travel time, the next speaker broadcasts simultaneously. And if a speaker does not broadcast during all of the mat to mat travel time, the user is left between mats without any musical cues. Broadcast time should coincide with the time it takes a traveler to get from one mat to the next. Thus a speaker should stay on until the succeeding one is triggered.

Secondly, when the AID System is turned on, mats on other routes are "live." This means that a speaker could be activated that is extraneous to the selected travel route. Thus, anyone who steps on a "live" mat by mistake could confuse a user traveling to a destination. To reduce confusion caused by the activation of "live" off-route mats, mats should only be "live" in a sequence corresponding to the logic of the selected route.

These design flaws contributed to increased staff time, effort, and frustration when using the AID System. Consequently, the staff did not find the AID System to be a labor saving device. In many instances, escorting clients to destinations would have been more efficient. Fortunately, both design flaws can be engineered out in a next generation device.

On the other hand, the staff felt that the AID System was an exciting and effective teaching tool. In fact, use of the AID System has been incorporated into the Pioneer's program for use with new clients and clients who have chronic difficulty traveling to indoor destinations.

Conclusion

The AID System was found to be a very useful tool for teaching indoor orientation to multiply impaired blind clients in a workshop setting. A second generation AID System needs to be designed, built and tested to see if operating efficiency can be improved to the point where the AID System can be considered a labor saving device. If it can (and we see no reason why not), then a number of pre-production models will need to be field tested. From our experiences in this project, it is reasonable to expect that the AID System would be well received in other facilities that serve multiply impaired persons.

References

Uslan, Mark M. "Teaching Basic Ward Layout to the Severely Retarded Blind: An Auditory Approach." New Outlook for the Blind, 1976, 70. 401-402.

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